



Department of Energy
Washington, DC 20585

JUL 18 2006

MEMORANDUM FOR DISTRIBUTION

FROM:

DR. INÉS R. TRIAY *Inés Triay*
CHIEF OPERATING OFFICER FOR
ENVIRONMENTAL MANAGEMENT

SUBJECT:

Interim Guidance on Safety Integration into Early Phases of
Nuclear Facility Design

The Office of Environmental Management (EM) is responsible for several newly constructed or planned nuclear facilities, as well as major modifications to existing nuclear facilities. The Department of Energy (DOE) has placed a renewed interest in ensuring that safety is fully integrated into the early phases of facility design. Through various field interactions, assessment activities, and Defense Nuclear Facilities Safety Board interactions, it is apparent that varying interpretations exist of how to properly implement certain safety design criteria that flow from DOE O 420.1B and the associated DOE G 420.1-2.

The Department has been working to strengthen DOE O 413.3, *Project Management for the Acquisition of Capital Assets*, so that nuclear safety requirements are clearer in the early phases of design. Another effort is underway to develop DOE Standard 1189, *Integration of Safety into the Design Process*. In August 2006, the Chief of Nuclear Safety will issue the standard list of nuclear safety requirements that will be applicable to all contracts involving EM's nuclear facilities. While EM will continue to support these efforts, it is necessary to provide interim guidance that clarifies the EM corporate position on safety and design integration.

The attached guidance has been endorsed by the Chief of Nuclear Safety, and provided to the Office of Environment, Safety and Health as input to the new technical standard (DOE-STD-1189) development activities. The guidance encourages additional emphasis and focus on safety during the early stages of project design, particularly at Critical Decision One (CD-1). The paper also proposes a more prescriptive approach on selection and design of safety systems for Hazard Category 2 and 3 facilities. For example, Hazard Category 2 facilities that process dispersible forms of radiological material would, at a minimum, select fire protection and confinement ventilation systems as credited safety systems, unless otherwise justified through a technically sound exemption.

We believe this guidance plus future changes to existing DOE requirements and standards, will improve the safety posture at several planned facilities.



If you have any questions, please call me at (202) 586-0738, or Mr. Dae Chung, Deputy Assistant Secretary for Safety Management and Operations at (202) 586-5151.

Attachment

cc:

James Rispoli, EM-1

Charles Anderson, EM-2

Russell Shearer, EH-1

Chip Lagdon, CNS-ESE

Frank Marcinowski, EM-10

Mark Gilbertson, EM-20

Mark Frei, EM-30

Jim Fiore, EM-40

Jack Surash, EM-50

Distribution

William J. Taylor, Acting Manager, Ohio Field Office (OH)
Keith A. Klein, Manager, Richland Operations Office (RL)
Roy J. Schepens, Manager, Office of River Protection (ORP)
Frazer R. Lockhart, Manager, Rocky Flats Project Office (RFPO)
Jeffrey M. Allison, Manager, Savannah River Operations Office (SR)
David C. Moody, Manager, Carlsbad Field Office (CBFO)
William E. Murphie, Manager, Portsmouth/Paducah Project Office (PPPO)
Jack R. Craig, Manager, Consolidated Business Center (CBC)
Cynthia V. Anderson, Director, Office of Site Support and Small Projects
Rodrigo V. Rimando, Jr., Brookhaven Project Director
Richard L. Dailey, California Sites Project Director
Richard B. Provencher, Assistant Manager for Environmental Management,
Idaho Operations Office (ID)
Stephen H. McCracken, Assistant Manager for Environmental Management,
Oak Ridge Office (OR)
Don Metzler, Moab Federal Project Director
Bryan Bower, Acting Director, West Valley Demonstration Project

OFFICE OF ENVIRONMENTAL MANAGEMENT INTERIM GUIDANCE

Safety Integration into Early Phases of Environmental Management Facility Design

The following guidelines are intended to supplement existing DOE requirements and guidance on the integration of safety into the early stages of nuclear facility design. A key component of a successful project execution is close coordination between facility designers, safety personnel and timely integration of safety considerations into the project management process. This requires parallel development and continuous coordination of the facility safety analysis and design processes.

The preliminary hazard analysis (PHA) is an important tool at the Critical Decision One (CD-1) stage that provides a basis for determining the design pedigree of initially selected safety systems, structures, and components (SSCs). The PHA should include initial scoping calculations of unmitigated radioactive material and hazardous chemical releases and associated consequences to onsite workers and the public. For safety significant SSC determination, evaluation points should be standardized for onsite workers using a clear evaluation guideline¹. DOE-STD-3009, Appendix A methodology should be used for determining an initial list of safety class SSCs.

Dispersion modeling that is used to support initial scoping calculations should be based on a standardized methodology that includes the following attributes:

- Use DOE Published Toolbox Codes;
 - Exceptions must be approved by DOE
 - Exceptions must have a valid technical basis
- 95th Percentile meteorological data to be used for both onsite and offsite;
- Deposition Velocity should be used at a value of 1 cm/s (NOTE: wet deposition velocity is not permitted);
- Dose Conversion Factors should be used consistent with ICRP-68/72;
- A surface roughness value of 3 cm should be assumed; and
- Building wake effects are not to be used in these calculations.

As the hazard analysis matures during the design process, these values may be refined based on local site characteristics. However, any deviation from the above assumptions must have a sound technical justification. Consideration should be given to whether local site characteristics may change with time (e.g., changing topography that might affect initial surface roughness assumptions).

¹ EM has proposed to use 100 rem (TEDE) at 100 m per DOE-STD-1120 and the current site practices. This evaluation point that is in addition to other qualitative considerations for establishing safety significant features for worker protection or significant defense in depth.

The PHA should result in a preliminary determination of design basis accidents in accordance with DOE-STD-3009-94. Consideration must be given a broad spectrum of man-made and natural hazards that could impact either the public or workers.

At the CD-1 stage of the design the primary focus is on determining an initial list of safety SSCs based on the type and magnitude of radioactive materials and the level of protection needed for workers and the public. This initial list is important so that preliminary design criteria can be established and provided to architects/engineers at the preliminary design stage that begins upon approval of the CD-1 package. The initial determination of safety SSCs must be conservative given the negative implications of having to modify the design to accommodate additional safety SSCs or higher design pedigrees at later stages of design maturity. The initial safety SSC list can be refined (i.e., enhanced safety margin) or sometimes reduced, with maturity of the hazard and accident analysis at later stages of design. This iterative approach is consistent with the traditional deterministic nuclear design philosophy where the safety analysis is used to confirm that the selected design standards and parameters would yield the expected high performance of safety and reliability as the design matures.

It is expected that Hazard Category 2 facilities, or Hazard Category 3 facilities with potential for significant onsite radiological consequences have robust engineering features to provide protection of the public and onsite populations. These type of facilities should, at a minimum, select fire protection (detection and suppression), confinement ventilation systems (CVS), and nuclear criticality design features or/and alarms (if the fissile material inventory poses criticality potential) as safety SSCs. These systems shall meet nuclear safety design criteria as required by DOE O 420.1B. In addition, any facility CVS shall meet the Performance Criteria specified in DNFSB Recommendation 2004-2 Implementation Plan Document "Ventilation System Evaluation Guidance for Safety-Related and Non-Safety-Related Systems" Table 5-1, or later successor criteria.

Hazard Category 2 facilities with significant onsite consequences, should default to Performance Category (PC)-3 criteria for natural phenomena hazards in accordance with DOE-STD-1021. If the PHA shows, however, that an unmitigated consequence without taking any credit for confinement or containment is less than the aforementioned evaluation guidelines then the confinement barrier may not require PC-3 seismic design. Further, a lesser pedigree seismic design may be justified in the later stages of design for facility structures, only if substantiated by technical bases such as higher pedigree design of the primary confinement system or barrier that would prevent the release of materials. This potential "downgrading" should, however, be made through a formal DOE review, approval, and exemption process that includes the Central Technical Authority.

The above guidance related to NPH should be used with a graded approach for major modifications since the existing facility may present major discrepancies with respect to new design goals.